We claim:

1. A multi-tubular reactor for fluid processing which comprises an array of catalyst-filled reactor tubes disposed in a reservoir of circulating heat-exchange fluid, wherein:

the catalyst in the reactor tubes includes at least one monolithic catalyst or catalyst support structure adapted to process a fluid stream at temperatures within a pre-determined processing temperature range, the monolithic structure being formed of a heat-conductive material and having a first average linear coefficient of thermal expansion;

the reactor tubes are formed of a heat-conductive material having a second average linear coefficient of thermal expansion, and

the operating gap distance between the reactor tubes and the monolithic catalyst or catalyst support structure does not exceed about 250 μm while the fluid stream is maintained at temperatures in the processing temperature range.

2. A multi-tubular reactor in accordance with claim 1 wherein the operating gap distance is a distance Gap_{op} calculated from the expression:

$$Gap_{op}=Gap(T_0)-D\bullet[CTE_2\bullet(T_2-T_0)-CTE_1\bullet(T_1-T_0)]$$

wherein $Gap(T_0)$ is the difference between the outer diameter (OD) of the monolithic catalyst or catalyst support structure and the inner diameter (ID) of the reactor tube when both are at ambient temperature, D equal ½ the sum of the outer diameter (OD) and the inner diameter (ID), CTE_1 and CTE_2 are the average linear thermal expansion coefficients of the monolithic catalyst or catalyst support structure and the reactor tube, respectively, and T_1 and T_2 are the operating temperatures of the monolithic catalyst or catalyst support structure and the reactor tube, respectively.

3. A multi-tubular reactor in accordance with claim 1 wherein the reactor tube includes multiple monolithic catalyst or catalyst support structures disposed within the tube in end-to-end thermal contact with one another.

4. A multi-tubular reactor in accordance with claim 2 wherein the operating gap distance between the reactor tube and the monolithic catalyst or catalyst support structure varies along the length of the reactor tube.

5. A multi-tubular reactor in accordance with claim 2 wherein operating gap distance between the reactor tube and the monolithic catalyst or catalyst support structure varies about the circumference of the reactor tube.

6. A multi-tubular reactor in accordance with claim 1 wherein the first average linear coefficient of thermal expansion is greater than the second average linear coefficient of thermal expansion.

7. A method for assembling a multi-tubular reactor for processing a fluid stream in a processing temperature range, the reactor incorporating an array of reactor tubes filled with one or more monolith segments of a monolithic catalyst or catalyst support, which comprises the steps of:

selecting a monolith segment of a monolithic catalyst or catalyst support structure, the segment being formed of a heat-conductive material having a first average linear coefficient of thermal expansion;

selecting a reactor tube formed of a heat-conductive material having a second average linear coefficient of thermal expansion;

sizing the monolith segment and/or the reactor tube to dimensions effective to provide (i) a non-interfering or slidably interfering fit between the monolith segment and the reactor tube when each is at a selected monolith mounting temperature, and (ii) an average gap distance between the reactor tube and the segment not exceeding about 250 μm when the monolith segment is filled with fluid at a temperature in the processing temperature range; and

inserting the segment into the reactor tube.

8. A method in accordance with claim 7 wherein the monolith segment is sized to dimensions effective to provide a non-interfering fit with the reactor tube, and wherein the first average linear coefficient of thermal expansion is greater than the second average linear coefficient of thermal expansion.

9. A method in accordance with claim 7 wherein the step of sizing the monolith segment and/or the reactor tube involves the step of heating and/or cooling one or both of the monolith segment and reactor tube to a selected mounting temperature effective to provide a non-interfering or slidably interfering fit therebetween.

10. A method in accordance with claim 7 wherein the monolithic catalyst or catalyst support is a composite comprising a honeycomb core element and a metal jacketing element.

11. A method in accordance with claim 7 wherein the monolith segment is sized to dimensions effective to provide a slidable interference fit with the reactor tube, and wherein the segment is inserted into the reactor tube with the application of inertial or pneumatic force.